O'Hare Airport Noise Home Insulation Program Shortfalls

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This report investigates the issue of how many homes fall within certain noise contours, including the air transportation industry's Federal Aviation Administration (FAA) guideline 65dB DNL and the similar public health protection institution's standard such as the World Health Organization's (W.H.O.) minimum recommended 55dB, under various considerations of Chicago O'Hare airport operational levels, both today's and future projections related to Chicago/O'Hare airport expansion ("modernization") proposals. FAA and O'Hare's acceptance of the need to "mitigate" the airport noise problems to W.H.O. recommended levels would be to admit to the need to spend several billion dollars on the program, rather than around a quarter of a billion on the current program track. To be generous, it is extremely doubtful that such acceptance will be forthcoming ("pigs flying"), leaving the public largely unprotected if such expansion proposals are approved and implemented.

Analysis and Results

The FAA's AEM (Area Equivalent Model)[1] was used to calculate noise areas within various DNL contours, for various airport development scenarios. Population densities around the airport were then used to calculate the number of homes within a contour for each scenario.

AEM calculates areas (square miles) for assumed dB DNL's (i.e., an estimated contour), for a user-defined level of aircraft activity (LTO's/day, divided between day/night)[2] corresponding to a user-defined set of aircraft types, automatically assigning the traditional 10dB noise penalty to night-time flights.

For this analysis, assumed activity levels were divided equally between the following aircraft mix, considered as representative though obviously not exact:

Table 1 – Aircraft assumptions

TYPE	T.O. WEIGHT (Lbs)	NOISE CERTIFICATION
737-400	121,000	STAGE 3
747-400	788,000	STAGE 3
767-400	380,906	STAGE 3
A-320	158,300	STAGE 3
A-340	544,500	STAGE 3

AEM calculates results based on one runway, with landings and takeoffs in the same direction. For the current airport conditions, it was assumed that two relatively identical runways would be in use, with activity divided equally between them, and non-overlapping noise contours. For an expanded O'Hare consideration, 3 runways were assumed, also with activity divided equally and non-overlapping contours. [This would be equivalent to 4 and 6 runways, respectively, used exclusively for landings OR takeoffs at any given time.]

The current airport activity level is assumed to be 474,500 LTO's/year, equivalent to an average of 1170 daytime and 130 nighttime LTO's. The expanded airport activity level is assumed to be either

[1] www.aee.faa.gov/noise/aem.htm

[2] LTO's = Landings and Takeoffs. Example: 100 landings plus 100 takeoffs = 100 LTO's and 200 operations.

(a) 600,000 LTO's/year[3], equivalent to 1479 daytime and 165 nighttime LTO's (1644 total/day) or
(b) 912,500[4] LTO's/year, equivalent to 2250 daytime and 250 nighttime LTO's (2500 total/day).

Of the total contour calculated area, only a portion will be residential in use. The FAA's recently released DEIS information allows estimation of this average percentage for some cases and extrapolations are made for others. The average city/town population density around the airport is assumed to be 9470 per residentially occupied square mile (see endnote for density data for various Chicago areas). It is further assumed that the average number of people per residence/home is 2.65. Thus, the number of homes in an area is estimated by multiplying the residential area times population density (9470), divided by 2.65.

Table 2 – Results <<<<<<<<<<<<<<<Post-Expansion>>>>>>>>>>>>>>>

DNL dB	Today's Area sq. mi.	Res. %	Res. Area Sq. mi.	Number Homes	1.2M ops/yr Area Sq. mi.	Res. %	Res. Area Sq. mi.	Number Homes	1.825M ops/yr Area Sq. mi.	Res. %	Res. Area Sq. mi.	Number Homes
70	8.4	1.5	0.13	450	11.1	2.7	0.3	1072	15	3	0.45	1608
65	21.2	11	2.33	8325	27.6	13.3	3.67	13,115	37.8	14.5	5.48	19,587
60	53	16.5	8.75	31,270	69	18	12.4	44,312	94.5	18.5	17.5	62,475
55	133	24.5	32.6	116,500	173	25	43.25	154,557	237.3	25	59.3	212,002
50	334	34	113.5	405,600	434	34	147.6	527,460	597	34	203	725,370

CONCLUSIONS

It is estimated that 8325 homes surrounding O'Hare airport currently exist within a 65dB or greater DNL area and would therefore qualify for noise insulating[5], per generally accepted FAA-industry guidelines[6]. The Chicago O'Hare Noise Compatibility Commission (ONCC) indicates that 4752 homes have been insulated to date (largely those in the 69dB DNL or greater areas), leaving about 3573 homes to go. At the current rate of 600/year, 65dB DNL program completion will take approximately 6 years, assuming no expansion in operations, either through straight increases in activity or through airport expansion, with corresponding activity increases.

If airport expansion and capacity/activity increases occur as proposed and projected, to 1.2 million operations per year, the total number of homes to be insulated would be increased to about 13,115[7] at that time. If during the ensuing 15 years time, with the 600/year rate of home insulation maintained

[3] The exact number of operations expected for the "expanded" airport, 10-20 years in the future, has seen estimates that vary between factors of about 1.2-2.0 versus today; the FAA's DEIS projection of 1.2 million ops/year is assumed here.

[4] In its proposed form, the maximum ops/yr airport capacity is estimated to be 2.0 million or more; 1.825 million is assumed here, basing it on average delays equivalent to today's.

[5] Not discounting any that may have been constructed after October 1998, which Chicago/O'Hare is excluding from qualification.

[6] The FAA uses 65dB DNL as the assumption for "highly noise impacted". This does not mean that others that live in lower noise areas are not impacted. As a matter of fact, the World Health Organization (WHO) considers 55dB to be "serious annoyance, daytime and evening" and 50dB to be "moderate annoyance, daytime and evening."

[7] FAA DEIS calculations show, strangely, only about 8500 homes, even with the substantial increase in operations. Some of the difference between that and 13,115 as calculated here, is perhaps due to DEIS assumptions of a quieter mix of planes then; the analysis here does not assume that. Also, it is estimated that only about a 1.4dB difference in DNL contours could cause this degree of difference (i.e., if the DEIS calculated contour was in error and was actually only a 63.6dB contour or the calculation here was actually a 66.4dB contour).

until then, and it is optimistically assumed that all of the previously 65dB DNL homes still lie within the expanded activity 65dB DNL contours, then the remaining number of homes to be insulated by then (13,115-4752)=8363 should see completion within that timeframe.[8]

But, 65dB DNL "mitigation" will of course not eliminate significant noise problems.

Table 3: W.H.O. guideline values for community noise in specific environments.
Ref: http://www.who.int/docstore/peh/noise/ComnoiseExec.htm

Specific environment	**Critical health effect(s)**	**LAeq [dB(A)]**	**Time base [hours]**	**LAmax fast [dB]**
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility & moderate annoyance, daytime & evening	35	16	45
Inside bedrooms	Sleep disturbance, night-time	30	8	
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60
School class rooms &pre-schools, indoors	Speech intelligibility, disturbance of information extraction, message communication	35	during class	-

As is seen in Table 3, the World Health Organization (WHO) and other credible institutions worldwide consider daytime noise at levels of 55dB DNL to represent serious noise health impacts, 10dB lower than FAA "guidelines" and definitions, and 50dB DNL to represent moderate noise impacts.[9] Furthermore, 30dB DNL is considered to be the acceptable maximum bedroom nighttime noise level for undisturbed sleep, which corresponds to 55dB outdoors with windows closed in a well insulated (noise) home.[10] This will obviously not be achieved in outdoor environments, homes with open windows, business' and multi-family dwellings[11], etc.

> *Many homes in the higher noise level areas (>60dB DNL) will also not achieve WHO nighttime noise level targets, even with insulation (and A/C in the summer to allow closed windows). The degree of typical outdoor-to-indoor noise reduction improvement provided by the O'Hare noise insulation program is unknown. The Residential Sound Insulation Program document states "…to assure that the program is meeting the Federal guidelines of*

[8] Remembering that the current O'Hare noise mitigation program excludes multi-family buildings and post October 1998 homes. Additional noise sensitive structures, such as schools, libraries, hospitals, etc. would also have to be accommodated.

[9] The FAA has no "guidelines" for residential noise mitigation at less than 65dB DNL and no definition for "moderate" noise conditions.

[10] Newer constructed or older "noise-proofed" homes should be capable of 25dB outdoor-to-indoor noise reduction (but not lower frequencies, e.g., 30-300 Hz.). Obviously, 65dB-25dB is 40dB DNL in the bedroom, not 30dB, as it would be with 55dB DNL outdoors.

[11] All of which are currently excluded from the O'Hare "noise mitigation" program.

reducing the interior noise levels in the homes an average of 5 decibels."[12] *The homeowners contract with the City states, "Homeowner understands and agrees that the City: (a) does not represent or warrant that Homeowner will experience any reductions in noise levels within the Residence as a result of the work…".*[13]

Returning to daytime noise considerations, it is seen from Table 2 that the estimated number of homes falling within 60dB, 55dB and 50dB contours rapidly increase to very large numbers. This is one of the main reasons the FAA and Chicago/O'Hare (and the air industry in general) have strong reason to pretend that, magically, "there isn't any noise beyond the 65dB DNL contour periphery", for to do so would be to admit that airport noise problems are seriously understated, that the number of homes needing "mitigation" treatment is tremendously larger, that sleep disturbance problems are not being sufficiently mitigated, that outdoor noise levels (>65dB) are really bad and that folks living in areas of less than 65dB in fact can not leave their windows open on warm summer days/nights (even though they are excluded from any mitigation programs).

Let's examine the facts in more detail (refer to Table 2). If the definition of "serious" noise was reduced by the FAA et al from 65dB DNL to 55dB DNL (W.H.O.'s recommendations[14]), the home count (those within the contour), with today's operational levels, would increase from *8325 to 116,500*! This would mean that the number of homes yet to be "insulated" would increase from 3573 to (116,500-4752)=111,748, taking 186 years to complete at the current ONCC administered 600/year rate! Of course, since it's all about money (surprise?), even if all of these 111,748 homes were completed within, say, a 15-year program, the cost would be around $3.4 billion![15] Is it any wonder that this topic and conclusion is one that is avoided or artificially deflected?!

What is the result after the proposed O'Hare airport expansion, to 1.2 million (FAA projected) operations per year? The number of homes needing noise-proofing (at the 55dB level) increases to approximately 154,557, requiring (154,557-4752)=149,805 homes remaining to be noise-proofed, for a total cost of around $4.5 billion! [Which could be completed in 24 years if the current program rate was increased by a factor of 10 (i.e., to 6000 per year!)]

Finally, most critics of airport expansion (O'Hare and numerous others nationwide) and the U.S. Department of Transportation claim that the real untold objective is to double or triple existing maximum airport flight capacities within about 10 years. The proposed O'Hare expansion program, if fully implemented, would actually allow more than 2 million operations per year, not just the 1.2 million that the expansion program is currently being judged on. The figure used here (Table 2) of 1.825 million/year assumes average delays approximately equal to those with today's configuration/operational level.[16]

With O'Hare airport rebuilt[17] as proposed, with 1.825 million operations per year, the total number of homes requiring noise "mitigation" increases to 19,587, leaving (19,587-4752)=14,835 yet to go, just

[12] Page 8, version circa 1999.
[13] Ibid, page 23.
[14] W.H.O.'s figures in the table are equivalent to DNL during the stated daytime period. Nighttime aircraft noise is weighted by +10dB to calculate DNL as used here (i.e. if nighttime noise was indeed 45dB Leq, it would become 55dB before combining with daytime noise, to calculate DNL).
[15] O'Hare/ONCC published historical figures place the average cost around $30,000 each, including A/C additions and corresponding heating system improvements, where needed.
[16] Much of which are caused by purposeful over-scheduling, rather than due to runway unavailability.
[17] It actually is, for all practical purposes, a brand NEW airport, not just a "modernized" one as proponents portray.

to meet 65dB DNL contour requirements. Cost= $445 million and time frame of about 25 years at the current rate (600/year)…perhaps an achievable quarter-century goal.

However, if W.H.O. "truth be told" and 55dB DNL becomes the objective, the home count skyrockets to 212,002 with (212,002-4752) = 207,250 left to be noise-mitigated at a cost of around $6.2 billion! [This job could be completed in about 20 years at a rate of about 10,000 per year!]

Will the FAA, Chicago/O'Hare and the air industry, including the United Nations', airline-dominated, I.C.A.O.[18] admit to this? Perhaps when pigs fly at 35,000 feet and 600 MPH!

SUMMARY

It is shown that if W.H.O. noise recommendations are NOT followed (55 vs. 65dB DNL), as is the case today, and if the FAA does NOT make O'Hare expansion approval contingent on post-expansion operational caps (at the projected 1.2 million ops/year), which they claim they can't, then the noise situation will, in reality (NOT what the FAA/O'Hare "says"), be quite terrible, with potentially more than 200,000 homes needing but not receiving noise mitigation. Even if that does occur, the outdoor noise environment will be permanently ruined over an area of a few hundred square miles.

The FAA/O'Hare will claim that such ruination is already here and will get worse with the proposed "do nothing" alternative. This may be true and is the reason critics don't accept this either, claiming that O'Hare environmental impacts are already cumulatively unacceptable (noise, pollution, public health impacts, etc.) and that the correct solution is instead to reduce O'Hare operations and place any new demands in new airports located in substantially less populated areas (with substantial noise and safety buffers), or in existing under-served (e.g., Mid-America, Rockford, Lambert fields) and other viable and sustainable alternatives such as a high-speed rail system.

Figure 1 summarizes the above home noise-proofing counts and vividly demonstrates the huge increase in counts and costs associated with these scenarios.

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END NOTE

Population densities of various example towns/cities. (Persons per square mile)

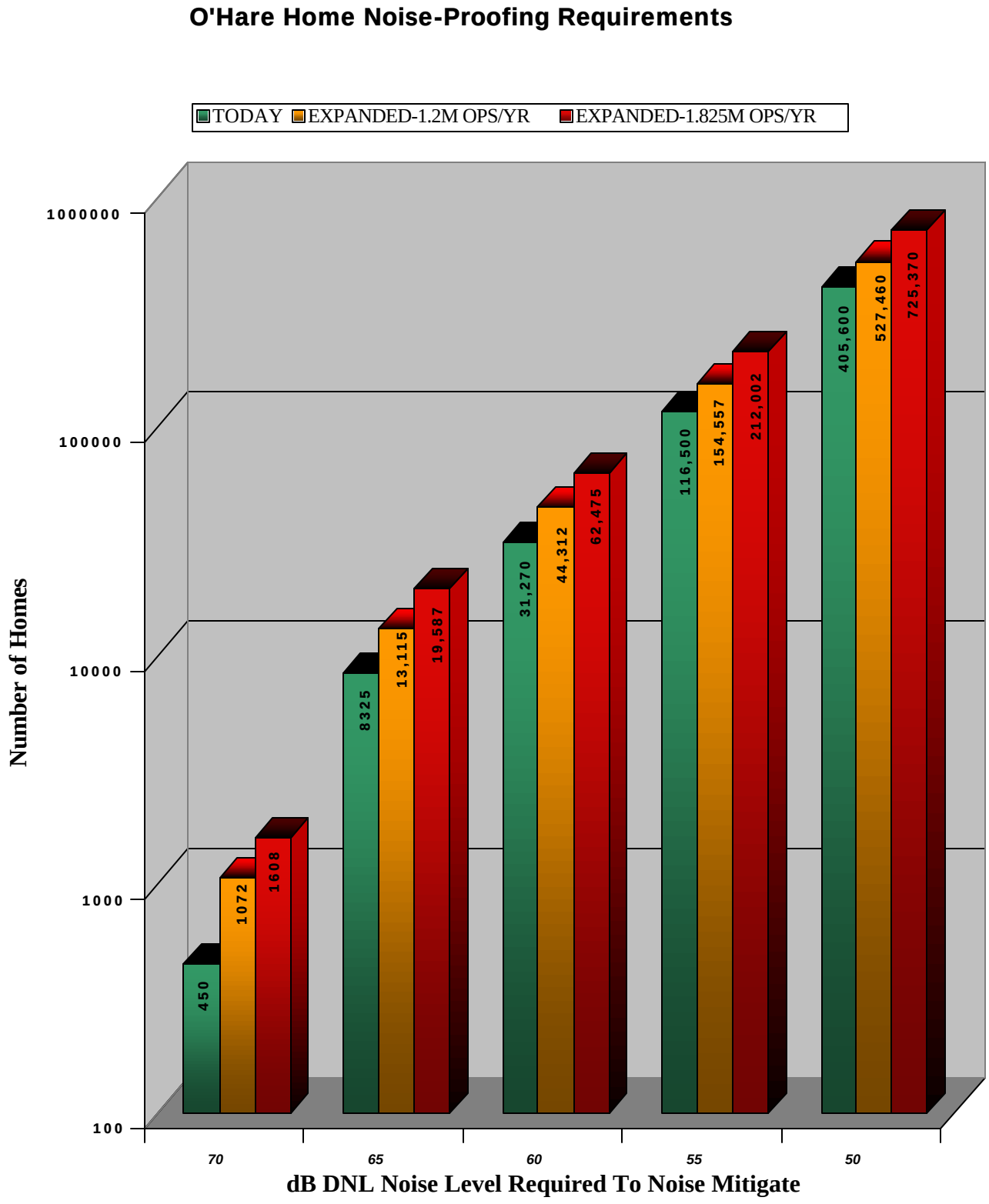
Cicero 14,644	Berwyn 13,875	Chicago 12,749	Oak Park 11,172
Evanston 9583	Oak Lawn 6427	Skokie 6308	Mt. Prospect 5513
Palatine 5047	Wheaton 4938	Arlington Hts. 4633	DesPlaines 4071
Schaumburg 3967	Elgin 3779	Aurora 3711	Naperville 3628
Joliet 2791	Orland Pk. 2668		

The typical density here for cities nearer to O'Hare is a population density of about 4735. However, this is for the entire city area, much of which is non-residential use. Assuming this to be about 50%, the typical population density for just the residential properties would be about 4735x2=9,470.

[Also see: http://www.demographia.com/db-citydenshist.htm for additional references.]

[18] International Civil Aviation Organization. The generally industry exclusive organization that drives most global air industry standards and recommendations and countries laws under cover of the United Nations.

Figure 1


O'Hare Home Noise-Proofing Requirements
TODAY
EXPANDED-1.2M OPS/YR
EXPANDED-1.825M OPS/YR
Number of Homes
1000000
100000
10000
1000
100
450
1072
1608
8325
13,115
19,587
31,270
44,312
62,475
116,500
154,557
212,002
405,600
527,460
725,370
70
65
60
55
50
dB DNL Noise Level Required To Noise Mitigate